

Crop Fertilization and Water Quality

No. 8

It has been estimated that fertilization accounts for 40 to 60% of global crop yields. Proper crop nutrition is essential to prevent massive global food shortages. However, when nutrients do not remain in the rootzone, their loss can lead to undesirable consequences. Great progress has been made in developing management practices that allow nutrients to be used efficiently and effectively by the intended crops.

Appropriate crop fertilization and water quality protection can go hand in hand. When nutrient management is a top priority, several water quality benefits are associated with balanced fertilizer use.

Erosion

Proper plant nutrition helps to produce a healthy, fast growing crop that has a vigorous root system that helps stabilize the soil and establishes a dense canopy to protect the soil surface. This results in:

- less water runoff and erosion; soil protection from intense rainfall by a healthy plant canopy;
- increased water infiltration to improve soil water storage, supply crop needs, and boost yield potential;
- more biomass left after crop harvest to help restore, maintain, and increase soil organic matter levels, which helps provide soil and cropping system resilience.

Nutrient Loss

By developing science-based nutrient management plans, and carefully using all available nutrient resources, farmers help to assure that most of the applied nutrients are taken up by the crop being grown. Nitrogen (N) and phosphorus (P) are the principal nutrients of concern with regards to potential water quality problems associated with fertilization or manure application. When they are used according to research-based best management practices, and in balance with other essential nutrients, there is usually only a small risk to either surface water or groundwater quality.

To protect water quality, care should be taken to use the right nutrient source, at the right rate, right time, and in the right place (4R Nutrient Stewardship). Soil testing and plant tissue analysis can establish which nutrients are actually in short supply.

While over-fertilization can result in water quality impairment, there is also risk to water quality from inadequate fertilization. Undernourished crops have smaller leaves and root systems, offering little protection of the soil from wind and water



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Modern crop production practices—which include reduced tillage, returning plant residues to the soil, and fertilization based on research-proven best management practices (BMPs)—help to build soil organic matter and improve crop yields and quality.

erosion. If the crop can't take up the nutrients it needs because of low soil fertility or improper fertilization, the risk of soil erosion—with the potential accelerated loss of soil P to surface water—is significantly increased, as is the risk of nitrate-N (NO_3^- -N) leaching into groundwater or NO_3^- -N movement to surface waters via subsurface drainage systems and stream outlets.

Cropping systems and nutrient management are dynamic biological systems. As a consequence, there is always potential for some nutrient leakage from the farm fields, such as during excessively wet years. Thus, fertilization is not fool proof. Nevertheless, a fertilization program based on 4R Nutrient Stewardship principles, and science-based best management practices, offers the best approach to meeting the world's food, feed, fiber, and biofuel needs while protecting our precious natural resources.

FOR FURTHER READING:

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